RECHERCHES LINGUISTIQUES DE VINCENNES

Recherches linguistiques de Vincennes

41 | 2012
New perspectives on genericity at the interfaces

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OpenEdition Journals

Electronic version
URL: http://journals.openedition.org/rlv/2092
DOI: 10.4000/rlv.2092
ISSN: 1958-9239

Publisher
Presses universitaires de Vincennes

Printed version
Date of publication: 1 September 2012
Number of pages: 103-122
ISBN: 978-2-84292-350-1
ISSN: 0986-6124

Electronic reference
Alice G.B. Ter Meulen, « Generics in information structure: exceptions versus counterexamples », *Recherches linguistiques de Vincennes* [Online], 41 | 2012, Online since 01 September 2014, connection on 19 April 2019. URL : http://journals.openedition.org/rlv/2092 ; DOI : 10.4000/rlv.2092

Recherches linguistiques de Vincennes 41 – 2012 – p. 103-122

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GENERICS IN INFORMATION STRUCTURE: EXCEPTIONS *VERSUS* COUNTEREXAMPLES

ABSTRACT

Why do we hold on to generic beliefs that serve explanations and our way of understanding the world, even if they run counter to facts or observational evidence with which they are incompatible? It often makes rational sense NOT to revise one's belief, even if counterexamples abound, relegating them to the harmless status of exceptions, rather than disconfirming facts. Investigating the focus/background structure arising from the interaction between aspectual adverbs, tense and bare plurals requires an interface of all modules of grammar—the Information Structure—at which the content of statements with bare plurals in discourse can be determined in context and epistemological differences between exceptions and counterexamples are accounted for. Generic information is persistent in recalcitrant situations, because its explanatory force is "immunized" against counterevidence. "Immunization" of information against counterevidence is a new theoretical semantic concept given precise content in an epistemologically flavored semantics of generics.

KEYWORDS

Counterexample, exception, explanatory force, focus, information structure, aspectual adverbs.

0. Introduction

Although the topic of generics and its relation to aspect and divisible reference has been on the backburner of my research agenda for quite some time, the kind invitation to speak at this Genius III conference has provided me with a welcome opportunity to address some new issues on the interface of temporal reasoning and generics. It proves to be very interesting to investigate the way we refer generically to situations that change over time, as kinds, like any individual, may change, acquire or lose properties. The linguistic entry point for such an investigation is to analyze the focus/background structure arising from the interaction between aspectual adverbs, tense and bare plurals. I will argue that this requires an interface of all modules of grammar, syntax, semantics and phonology, called here the Information Structure, at which the content of statements with bare plurals in discourse can be determined in context. It will require a better understanding of the epistemological differences between exceptions and counterexamples, where I will advocate the view that formally generic information is persistent in recalcitrant situations, because its explanatory force is, as it were, "immunized" against counterevidence. Persistence is a dynamic model theoretic notion familiar from Situation Semantics (Barwise and Perry (1983), Seligman and Moss (2011)), basically modeling how information may be preserved in changing models. The notion of "recalcitrant situation" was defined in an earlier paper of mine (ter Meulen (1986)), where a situation is said to be recalcitrant if it conflicts in a particular way with information otherwise accepted as true, as illustrated further below. "Immunization" of information against counterevidence is a new theoretical semantic concept that I will try to give precise content in a more epistemologically flavored semantics of generics, formal details of which are to be found in the appendix. The central question of the present paper is how and why we hold on to generic beliefs that serve our explanatory purposes and way of understanding the world, even if they run counter to facts or observational evidence with which they are not compatible in any logical way. It often makes good and even rational sense NOT to revise one's belief even if counterexamples abound, as these can be relegated to the harmless status of exceptions, rather than disconfirming facts.

1. Review of linguistic tests for generic interpretations

Before we set out on this investigation of the new generics issues to be addressed in Information Structure, it will be useful to review the battery of tests on generic statements discussed in the collectively written introduction to the *Generic Book,* (Carlson and Pelletier (1995), p. 1-124). With our current hindsight, most of these tests seem to make a point in the right direction, but

at the same time they also miss some essential insight. This review will serve to compile a list of new desiderata for our investigation in the remainder of the paper.

1) The first test stated that the syntactic position of a bare plural NP matters: as external (1) or internal (2) argument of an episodic VP, it is interpreted as existential, referring to a group of some students. Projected to Spec CP, it is always interpreted as generically referring to students, as in (3).

(1) Students [$_{VP}$ arrived late].

(2) I saw [$_{VP}$ students arrive late].

(3) I expect [$_{CP}$ that students [$_{VP}$ t arrive late]].

This test certainly indicates that the syntactic position of a bare plural constrains its possible interpretations, but, as was quickly pointed out, not every kind of VP-predicate allows this pattern of variation. The question is still open which VPs don't and explain why.

2) The second test required that a bare plural in extensional unselective binding contexts results in a characterizing statement with episodic or stage level VP-predicates, as in (5). With intensional or individual level VPs, as in (4), the bare plural is hardly acceptable, unless it is intended to create a contrast to other NP referents, available in context or from prior discourse, often marked prosodically.

(4) ??Students (often) are required to register for credit courses.

(5) Students (often) arrive late.

The idea that discourse contrast may have something to do with the acceptability of (4) points to the need for an interface level where prosodic properties of bare plurals may determine their interpretation. With standard intonation, the interpretation of (4) remains at least problematic, as if some students had such a requirement to register and others didn't.

3) The third test showed that with non-distributive VPs bare plural subjects must refer generically to the kind, as the VP must denote a "kind level" property, as in (6).

(6) *Foreign students are everywhere*.

An issue that remains unresolved is to explain how kinds, if they are intensional objects, varying their membership, *i.e*. denotation, over time, can apparently have such extensional properties. "*Being everywhere*" can hardly be considered an intensional property, which would require consideration of alternative situations, other than the current one, in the interpretation.

4) The fourth test was intended to show the importance of a pre-theoretical concept of a "well-established" kind, with which certain adjectives may form complex names of kinds, as in (7) and (8).

(7) Foreign/*tall students are everywhere.

(8) Heavy/*muddy water is undrinkable.

This test certainly pointed in the right direction of the role for shared normative judgments implicit in generic statements. We don't recognize a kind of tall students, for tallness is considered a contingent and changeable property. Foreign students are easily considered a particular category or classification of students, just as first year students would be, even though the set of first year students changes every year by definition. The exact semantic relation between such generic statements and implicit norms of what counts as a well established kind, remains to be better understood. In this paper I will argue that the implicit normative character of generic statements often derive from coherent patterns of explanatory relations that give generic statements their generalizing force and explanatory power.

5) The fifth test requires an episodic ("stage-level") and existential interpretation, *i.e.* not characterizing statement, for a bare plural subject with a progressive tense VP, as in (9).

(9) Students are drinking beer.

In (9) the bare plural cannot refer generically to students as a kind, but instead introduces a set of students who are described as drinking beer in a particular event, overlapping with the time (9) is issued. What makes a property an *episodic* property has never really been made precise, as it is in English never morphologically marked. Generic statements may also contain progressives, and, as we will see below, kinds may also acquire or lose properties.

6) The sixth test appealed interestingly to the notion of an exception. It required characterizing VPs should denote "essential" properties, but allow for exceptions, as in (10).

(10) Students are privileged/*ill.

Being ill is a stage-level or episodic property, that individuals regularly acquire or lose over time. But being privileged is a more intensional property, sometimes called an "emergent" property like intelligence, as it does not describe any one particular extensional property that holds of all individuals who are considered privileged. A generic statement as (10) may be true in a situation even where students are present who are not considered privileged, constituting exceptions to (10) that do not affect its truth. It is sometimes argued

that the appeal to exceptions points to an implicit adverb, like "regularly", but consensus arose quickly that no adverb could universally serve such a purpose and explain the notion of an exception to its regularity in an insightful way. The notion of exception still requires elucidation, which this paper is intended to contribute to.

7) The seventh test clarified that only existentially interpreted bare plurals, as in (11), are monotone increasing, whereas generic reference to kinds with complex NPs, as in (12) does not conform to such inference patters, since they behave semantically like proper names.

(11) Students in semantics are taking an exam.
⇒ Students are taking an exam.

(12) Foreign students are required to register.
$\not\Rightarrow$ Students are required to register.

Proper names are self-dual in the theory of generalized quantifiers, so the well known tests of monotonicity do not apply. Even complex names of kinds behave in this respect just like proper names, as we see in (12).

8) The eighth test showed that bare plural subjects in characterising statements have downward entailing restrictor as long as the intersective adjective in the entailment preserves the characterizing nature of the statement.

(13) a. Students must register for credit courses.
⇒ First year students must register for credit courses.

But not just any arbitrary properties will do as restricting properties, for contingent stage-level properties such as tall, do not conform to this decreasing inference pattern, as (13b) cannot be derived validly from the premise of (13a).

(13) b. $\not\Leftarrow$ Tall students must register for credit courses.

This test indicates that, again, generic information must appeal to some conceptual notion of well established kind, as we discussed in test (4) above. Properties used to test the monotone decreasing inference pattern must be kind denoting in combination with the noun they modify, and stage-level or episodic properties won't do.

9) The ninth and final test recognized that intonation and prosody enters into the equation of determining the correct interpretation of bare plurals. In (14a) a high pitch stress contour on the indexical "*this*" creates a contrast with other parts of the Pacific. In the context of discussing where typhoons may arise in the Pacific, (14a) expresses that in contrast to other parts of the Pacific, the location the speaker is (pointing) at now, which is also part of the Pacific, is such that typhoons typically arise there, giving a generic interpretation to the bare plural.

(14) a. Typhoons arise in THIS part of the Pacific.
b. TYPHOONS arise in this part of the Pacific.

The high tone pitch contour on the subject NP in (14b) indicates that, besides all the other things that may happen in this part of the Pacific, typhoons typically happen here too, giving an existential interpretation to the bare plural as a characterizing sentence about this part of the Pacific. (*cf.* Carlson and Pelletier (1995), p. 24-25). This points clearly in the interesting direction that prosodic marking indicates the structural partitioning of information a sentence expresses, in a part "about which" information is given and a focus part providing that information. This semantic partitioning is extensively studied in much simpler, non-generic statements in the current research program of focus structure (Kadmon and Roberts (1986), Reinhart (1981), Rooth (1992)). If prosodically marked parts of a statement are in focus, and hence provide new information, they are mapped in the semantics to the matrix or sometimes misleadingly called (nuclear) scope where they are existentially interpreted, as opposed to the restrictor which incorporates backgrounded or commonly shared information supposedly universally quantified.

(15) FIREMEN are altruistic.

Marked prosody does not always fully determine the interpretation of bare plurals, as in (15) the prosodically marked subject NP seems still generically interpreted as referring to the kind firemen, but it is supposedly mapped to focus. This is only one of the puzzles concerning the interaction between prosody and information structure that remains for closer investigation.

These nine tests have given us some idea of what a proper semantics of generics still requires from us, if we adopt formal methods which allow a proper characterization of inference as core semantic concept, that may provide a novel research connection to psycholinguistic issues investigated in cognitive science. A proper, formal characterization of what makes a VP denote an episodic property, where bare plurals in Spec of CP are always interpreted generically, will also answer why progressives may describe changing kinds, generically referred to by the subject NP. A proper account of focus/ground partitioning at the level of information structure will require further analyses of the role of prosody in the interpretation of generic statements, which may overrule syntactic criteria for semantic interpretation. Furthermore, we need to understand better how generic information is "immunized" against counterexamples, as serving our need to preserve their explanatory force by relegating them to the status of exceptions, that have a special epistemological status and cannot affect the assumed truth of generic statements.

2. Restricting *versus* background information

To explain first what it means for generic statements to be "immunized" against counterevidence, it serves to remind ourselves that many ordinary generic statements already resist rejection in the face of (generic) counterexamples available as background information.

(16) Lions have manes.

Consider (16), which is the most "plain vanilla" generic statement I can think of. Obviously we all know that there are whole groups or even subkinds of lions that don't have any manes, such as female lionesses, little lion cubs, or bald lions. The individual lion cub Simba, well known from the Disney movie the Lion King, doesn't have any manes either. All of these lions are maneless for some good, generic, biological reason, to which we appeal in explaining why they are still lions, even though they have no manes and yet we maintain our belief that (16) is true.

Quite similarly, the Tarskian prototypical truth-functional proposition in (17) is considered a generic truth, but we also know only too well that snow is often not white, *e.g.* not in the city hours after snowfall, not when it is melting, not when polluted, or dyed etc.

(17) Snow is white.

Nevertheless we maintain the truth of (17) in the face of such counterevidence, which are quite ordinary worldly circumstances in which the color of snow is other than white.

Anyone who would object to the truth of (16) or (17) on the basis of such counterevidence would be regarded as misunderstanding their meaning, or being impossibly pedantic about matters semantic. Proper linguistic competence comprises the common knowledge that generic information is maintained in the face of counterevidence by excluding or disqualifying it from offering falsifying instances of property of the kind referred to. Exceptions are understood to be harmless and in fact epistemologically necessary to give generic information its special status as "immunized" information, whose truth is maintained in the face of counterevidence, either generic or individual and episodic. What sets counterexamples apart from exceptions is that the latter can be explained away and accounted for within our belief systems as disqualified from playing any falsifying role as counterexamples.

If the semantics of generic statements requires a partitioning of background information and focus information, which is supposedly new, the verifying assignments of the background conditions will each require an extension that verifies the new descriptive conditions added by the focus for the generic statement to be true. Such universal quantification over given

partial assignments and their associated extensions, is logically on a par with the semantics of conditionals. Here Jon Barwise's early insights into dynamic semantics may well remind us of the limitations of spelling out all the background conditions that may play an information-theoretic role in the semantics of generics.

> *"There is simply no reason to suppose that there is any way to flesh out a conditional statement to incorporate a description of the exact conditions under which the conditional holds, or even the conditions under which the speaker believes it to hold."* (Barwise (1986), p. 31)

Since the semantics of generics I pursue in this paper requires an account of requirements on common background conditions (CG), we foremost need to investigate the ***structure*** of information. This is not a question of metaphysics, *i.e.* to what sort of entities a VP denotation applies, *e.g.* a stage, an individual or a kind, but rather a matter of information structure: how does the generic statement address a, albeit sometimes implicit, issue at stake in the conversation, and how does it resolve that issue by contributing new information. Whether information contained in a statement is generic is *epistemic* issue, for it must have explanatory force, connecting to our web of beliefs, and come equipped with shared, backgrounded understanding regarding its admitted exceptions. The semantics of generics must hence be connected to questions of the dynamics of information flow, issues regarding how beliefs may be preserved, communicated, in order to become shared, or revised by resolving conflicting information. Taking this epistemic or information-theoretic perspective on the semantics of generics, I will make these three core assumptions:

(i) CG information is highly structured, this structure is constitutive of interpretation.
(ii) Structure of the "conversational background" needs investigating,
(iii) Tense and aspect can no longer be ignored.

3. The structure of the common ground

In investigating the role of the common (back)ground (CG) in which generics are interpreted, the core issue (CI) often implicit in the semantic interpretation of generics is often a *why*-question, as (18a) illustrates for the generic statement answering it in (18b), and (19a), which, together with the common ground information in (19b), is answered by the explanatory generic information in (19c).

(18) a. CI: Why do firemen risk their lives?
b. Firemen are altruistic.

(19) a. CI: Why did John not get away before the WTC collapsed?
b. CG*:* John was a fireman.
c. Firemen are altruistic.

Whether a statement carries any explanatory force depends strongly on shared background (CG) and can never be determined by considering only its syntactic form, prosodic properties or truth functional content.

(20) a. CI: Where is Jim?
b. It is Monday.

The CG of (20) is, supposedly, a situation in an office, it is Monday, Jim is a flexworker and lives far away. Even though everyone is undoubtedly already aware that it is Monday and (20b) cannot properly be considered to contain new information for anyone in the situation, asserting it still has important communicative effects. For the assertion of (20b) makes the questioner, an overt one or an abstract entity, infer the answer to (20a) by an inference to the best explanation, often called "abduction". He may reason as follows: like anyone else, Jim prefers to spend his weekends at home, and he lives far away, so every Monday he is traveling back to work. As flexworker, he is free to determine his own working hours, so that explains why he is not here today, as it is Monday: he must be on his way.

Such a chain of inference is supported only by the assertion of (20b), saying what everyone already knows, since an answer that, instead of (20b), would contain perhaps new information, as in (20c), would not support such an inference.

(20) c. He is traveling.

If (20c) were asserted in the same situation in response to the question (20a), it would be unclear, for instance, whether John was traveling for his work or returning from his weekend at home.

A fundamental departure is hence proposed from the classical approach to the semantic analysis of generics with tools based on truth conditions relative to models, structured sets of accessible worlds or other indices, context or informal notions of "conversational background" to the epistemic approach advocated here, with structured set of information conditions, to characterize informative content, and to analyze what generic statements are *about*. It will have as ultimate goal to understand how, for instance, (20b) and (20c) come to serve such different roles in explanations, answering *why*- or other *wh*-questions. Clearly, one and the same syntactic phrase can be used in various ways to contribute radically different explanatory information, if used in different contexts.

4. Structures of Situations

This section presents the basic semantic tools derived from Situation Semantics, to account for the fact that generic information is persistent

through "recalcitrant situations", and to formally analyse what we mean with immunization against counterexamples. The details of the formalization can be found in the appendix to this paper.

A basic tenet of Situation Semantics is that information arises out of this world by action. Although we can imagine that the world would be different from what it is, and hence alternatives to the situations in this world are "epistemically accessible", there is no need to assume that there are possible worlds, as complete sets of facts possibly different from this world.

Situations are realistically structured from space-time locations, primitive properties, individuals that may be the bearers such properties, and the positive (+) and negative (–) polarities. Any of these constituents of situations may also be indeterminate constituents of situation-*types*, which serve to classify situations of the same type, to capture similarities across situations. If situations are of a certain situation-type, the values of the indeterminates in the situation-type are fixed in these situations.

A *Structure of situations* $\boldsymbol{S}$ has collections of both factual and actual situations, assuming that actual (= true) situations must be basically coherent: (i) no conflict in polarity and (ii) everything is identical to itself. Parts of an actual situation must be factual. A situation in any subset of the factual situations must be part of an actual situation.

Persistence of information is a relation between (i) the collection $\boldsymbol{\mathcal{M}}_{\mathbf{C}}$ of meaningful options for a particular factual or actual situation s_0 and (ii) the collection $\boldsymbol{\mathcal{P}}_{\mathbf{C}}$ of situations *not* precluded by that situation s_0.

A situation s_1 is a *meaningful option* (*cf*. def. 4 appendix) for a given situation s_0 when any way you fix the value of the indeterminates in type S_0 that makes s_0 of that type S_0 can be extended to fix the value of the indeterminates in S_1 to make s_1 of type S_1. Meaningful options hence determine how you can add new information, while preserving all information that is already available in the given situation.

The *precluded* situations may be thought of as inaccessible situations from s_0 in the structure $\boldsymbol{S}$. It would require a structural revision in $\boldsymbol{S}$, eliminating inconsistencies or some of its meaning-inducing constraints to render a situation accessible that would at first be considered precluded. In other words, precluded situations contain information that is fundamentally incompatible with what you already know or perhaps claim to know. Together the meaningful options and the situations that are NOT precluded, given any particular situation in a structure of situations, determine what new information you may learn, given what you already know, unless a more fundamental revision of your beliefs would alter the structure, such that totally new situations may become available to you. Rearranging the constraints that hold in the structure of situations is one way in which you may conservatively change your beliefs so that a once precluded situation may become not-precluded or even a meaningful option.

Such dynamics of the interaction between meaning and interpretation has always been at the heart of Situation Semantics, though it has taken a long time to digest its abstract message for linguists in interesting linguistic applications.

5. Generic information and explanations

Applying this toolkit of Situation Semantics to generic interpretations of bare plurals, we need first to define a *generic* situation-type as an abstract situation-type $K(\langle x, S_n \rangle)$. A generic situation-type $K(\langle x, S_n \rangle)$ is *realized* by an individual *a* iff. some way of assigning a value of the indeterminate *x* is *a* and $S_n[a]$ is factual, *i.e.* if *a realizes* $K(\langle x, S_n \rangle)$ then *a* is a *member* of the kind *K*.

Characterizing statements form a meaningful relation between kinds, formalized as constraint $\mathcal{C}$:

$$\mathcal{C} = \langle l_u, \langle involve, K_1 (\langle x, S_1 \rangle), K_2 (\langle y, S_2 \rangle) \rangle, + \rangle$$

For instance, (18b) expresses the constraint that relates two generic properties, being a fireman and being altruistic.

(18) b. Firemen are altruistic.

(18) c. $\mathcal{C}_1 = \langle l_u, \langle involve, K_1(\langle x, \langle l, \langle fireman, x \rangle\rangle, +\rangle), K_2(\langle y, \langle l, \langle altruistic, y \rangle\rangle, +\rangle), +\rangle$

The meta-theoretic relation "involve" merely relates the two kinds, but it does not admit any reduction to quantified relations between members of the kind. Hence, for (18b) to be true the constraint in (18c) should be included in the Situation Structure adopted in the interpretation. It does not entail or even suggest that all firemen are altruistic, nor that some or many are. There is no logical relation between the truth of a constraint in a structure of situations and the quantified relations between the corresponding sets of members, unless there is particular information additionally available in the structure that supports such a connection.

If you are *attuned* to a constraint $\mathcal{C}$, you realize that there is this correlation between its constituent kinds and you adjust your behavior accordingly, *i.e.* you use the constraint to guide your expectations. A situation *s* in $\mathcal{S}$ is *recalcitrant* with respect to a constraint $\mathcal{C}$ when your expectations fail in *s*, *e.g.* an individual egoistically behaving fireman constitutes a recalcitrant situation for (18c) in $\mathcal{S}$. Recalcitrant situations do constitute individual counterexamples to the co-instantiation of the two kinds in the constraint $\mathcal{C}$, but $\mathcal{C}$ itself persists in $\mathcal{S}$. Since generic information always has the form of a constraint, no recalcitrant situation can directly discredit its truth within the structure of situations. Constraints may, however, be ranked according to some preferences of an individual or of a group or of even entire linguistic community. Such rankings may be affected by recalcitrant situations, and the

credibility of constraints may be de- or increased, if a sufficient number of independent recalcitrant situations are encountered.

A structure of situations $\mathcal{S}$ contain many different and separate chains of constraints, partially ordered as $\mathcal{C}_n \leq \mathcal{C}_{n+1}$: $\forall$ *s* if $[\![s]\!]_{\mathcal{C}_n}$ then $[\![s]\!]_{\mathcal{C}_{n+1}}$. Ordered chains of constraints give us, for instance, a biological taxonomy of kinds, which itself induces an order on explanatory force of generic information.

To illustrate this explanatory force of generic information, consider the CI in (21a) and its answer in (21b).

(21) a. (CI) Why are firemen altruistic?
b. They are very well paid.

There are two constraints at stake in this dialogue, informally for (21a) $\mathcal{C}_1$: *Firemen are altruistic*, and for (21b) $\mathcal{C}_2$: *Firemen are very well paid*. If these constraints are chained in a ranking $\mathcal{C}_2 \leq \mathcal{C}_1$, (21b) explains that firemen are altruistic ***because*** they are well paid. If the reverse ranking would hold in the given structure of situations, $\mathcal{C}_1 \leq \mathcal{C}_2$, it is inferred that the reason why firemen are well paid is that they are altruistic.

If subject bare plurals are prosodically marked, as in (22b) (= 15 above), they are interpreted as providing new, focus information, answering a CI requesting it and determining its range of alternative options to chose between.

(22) a. (CI) What sort of people are/Who is altruistic?
b. FIREMEN are altruistic.

The content of (22a) is generic query Q, which contains a kind level indeterminate property P shared with the generic property of being altruistic:

$$\mathcal{C}_Q = \langle l_u, \langle involve, K_1 (\langle P, \langle l_u, \langle P, x\rangle\rangle, +\rangle), K_2(\langle y, \langle l_u, \langle altruistic, y\rangle\rangle, +\rangle), +\rangle$$

The set of focus alternatives for P is the range of possible values P may be assigned in the structure of situations, given $\mathcal{C}_Q$ and the set of chains of constraints it supports: let it be the set $\mathcal{V}$ = {firemen; doctors; nurses; parents; grandparents; bakers; children}.

The explanatory answer provided by (22b) is also interpreted to provide a constraint $\mathcal{C}_A$:

$$\mathcal{C}_A = \langle\langle l_u, \langle involve, K_1 (\langle P, \langle l_u, \langle P, x\rangle\rangle, +\rangle), K_2(\langle y, \langle l_u, \langle altruistic, y\rangle\rangle, +\rangle), +\rangle \,\&\, P = \langle x, \langle l_u, \langle fireman, x\rangle, +\rangle\rangle\rangle.$$

The focus reply in (22b) hence provides the property of being a fireman as resolution to the indeterminate property in the backgrounded CI in (22a). Details of a fully developed, preferably entirely compositional account must await a future occasion, due to the time constraints imposed on the present paper.

6. Information Structure: changing kinds or habits

In the inspiring paper Horn (2000) p. 151, the discussion on generic or habitual information in focus contexts provides interesting data for our semantics of generics. Consider (23a), which contains a topicalized negative focus particle (*not only*), coordinated with a plain assertion, which semantically strengthens the descriptive content of the topicalized phrase.

(23) a. Not only does he like her, he loves her.

Not only p presupposes *p*, and this subordinated presupposition survives negation to be inferred from the entire phrase. The inversion of the auxiliary *do* and the subject NP requires a negative, downwards entailing context, as the positive polarity discourse in (23b) is marked, if not downright unacceptable, given the commonly accepted meaning of *love* and *like*.

(23) b. ??He only loves her. He doesn't like her.

The global maxim of coherence requires strengthening in such structured contexts, where the second phrase should offer stronger content than the preceding one. In the marked (23b) this would amount to inducing the counterintuitive claim that $e_2 \leq e_1$, hence liking someone would be stronger than loving someone, if (23b) were asserted as descriptively correct. We see that the structure of such polarized discourse prevails over the commonly accepted lexical meaning. Induced by the partial ordering of *only,* the discourse order is not required to be "natural" or conforming to commonly accepted norms or default assumptions on the way things ordinarily should proceed, as we see in (24) and (25).

(24) Not only would I rather be in Paris, I would even rather be in Seine St. Denis.

(25) No longer does she only like him, she (now) (even) loves him.

Given in the CG that Seine St. Denis is a much less desirable place than Paris, we infer that the speaker of (25) judges his current location to be ranked as the least desirable, even below a rather unlikeable place like Seine St. Denis. In (25) the negative aspectual adverb *no longer* licenses the inversion in the polarized phrase, triggering the negatively polarized presupposition that survives as an inference from the entire sentence (see Smessaert and ter Meulen (2004) for the logical semantics of aspectual adverbs). The main phrase provides a contrasting positive polarity *even* to strengthen the predicate between the arguments of both phrases, entailing the polarized presupposition of the subordinate inverted phrase. The set of focus alternatives in a structure of situations S comprises all available possibly meaningful options given for s_0 given $e_2 \leq e_1$.

Pursuing our investigation of the interaction of aspectual adverbs with bare plurals, to understand how we reason generically about changing kinds, the focus alternatives to be considered are two dimensional, consisting of a temporal axis, with its common temporal precedence scale, and the ranking of emotional attitudes, where liking is considered ranked less high than loving. The presuppositions of the aspectual adverbs are preserved in the interpretation and may be overtly reported as inference using the adverb *still*.

Ranking of alternative attitudes must also create a scale, formally a chain of constraints $\mathcal{C}_2 \leq \mathcal{C}_1$. Consider (26a), which presupposes the first, past tense conjunct of (26c) and asserts the present tense second conjunct. Logical relations between tenses and the adverb *now*, allow the inference to (26b), switching the two available temporal focus alternatives {late; in time}.

(26) a. Students are **no longer** arriving late.
b. Students are **now** arriving in time.
c. Students were arriving late and no longer are.

Given (26a), any late student is now an exception, requiring an explanatory excuse, but maintaining the constraint in the structure of situations. Contrasting (26) to an ordinary episodic, but universally quantified statement as in (27), any formerly and currently late student would falsify it evidently, as (27) requires all once late students to arrive in time now.

(27) All students were arriving late and now they aren't arriving late.

The aspectual adverbs interact smoothly with bare plurals in characterizing sentences as (28), where *still* admits partitioning the denotation of the bare plural, *i.e.* the membership of the kind, in the non-empty set of students who arrived late and still do and the set of those that have changed their habits, now arriving in time.

(28) Students are still arriving late ⇒ Some students arrive in time, some late.

The decreasing scale associated with *still* makes us infer that, as time passes, ever more students will be arriving in time, so there are fewer late students each day. Recurring counterexamples to the persistent changing trend described in (28), may be considered too many, relative to some tacit, commonly accepted norm. This will make the trend reverse, leading to a revision of belief that reranks the chains of constraints accordingly, but such is not really the subject matter of the semantics of natural language.

The increasing adverb *already* supports the same inference about the partitioned membership of the kind with (28), but the CG now contains the inverse expectation that more students will be arriving late as time passes, hence fewer will still arrive in time.

(29) Students are already arriving late ⇒ Some students arrive in time, some late.

To complete this investigation, the aspectual adverb *not yet* in (30), supports the inference that no students arrive late, and the expectation or fear perhaps that they may start to arrive late.

(30) Students are not yet arriving late ⇒ No students arrive late.

Although any late student would now still be an exception, given (30), the expectation is that late students will become more prevalent, as time passes. Further discussion and formalization of such inferences must be deferred to another occasion.

Clearly, not only syntax, compositional semantics and the lexicon are required for Information Structure, but the systematic partitioning of focus information and core issues at stake is needed. This would allow for additional complexity in the information structure, where (31) provides an instance of prosodically marked bare plurals that create a contrastive topic, given the logical interaction between the aspectual adverbs *still* and *no longer*.

(31) a. Students are still arriving late, but TEACHING ASSISTANTS no longer do.

For the interpretation of (31) a layered focus would require constrastive topics:

(31) b. CG: Students and TAs are arriving.
c. CI : timing of arrival of students and TAs. ***When*** do they arrive?
d. 2D space of focus alternatives: 1) {in time/late}, 2) temporal axis
e. Contrast inside the topic: {students/TAs}

The presupposition of *still* and *no longer* make us infer that in the past both students and TAs arrived late, and the focus information induces a new constraint, that TAs arrive in time.

To conclude this rather more exploratory section of the paper, let me add three interesting, but complex examples from corpus data, showing a similar ranking of constraints:

(32) The number of people coming to our apartment rose, now they were no longer only coming on the weekends, but would sleep over all week long.

(33) Style was no longer only a matter of aesthetic choice, but had historical, social, and political overtones.

(34) New England's economy continues its modest pickup. Retailers say shoppers no longer only respond to discounts. They're spending money on full-priced goods as well.

In all three cases (32)-(34) *no longer* only triggers a presupposition that is preserved in the discourse, and serves as basis for strengthening the claim in

the assertion. In (32) the strengthening consists of a longer duration, in (33) the new aspects of the subject that strengthen from mere choice to supposedly more objective overtones, and in (34) the strengthening consists of the value of goods shoppers are said to respond to. It is not really a task for the semantics of natural language to specify for each individual case what exactly the strengthening consists in, but the logical properties of scalar inference and inversion are sufficient for a rich theory of temporal reasoning about changing habits and kinds.

7. Conclusions

In conclusion, briefly, let me summarize the four main points of this paper:

1. Generic information is content determined at information structure level, the interface of all modules of grammar.
2. Constraints in a structure of situations are persistent in the face of recalcitrant situations: counterexamples falsify quantified statements, but are considered exceptions to generic information.
3. Generic focus information answers (implicit) *why*-questions as central issue at stake.
4. The dynamics of the interaction of establishing focus alternatives and quantifying over extensions of conditional situation-types provides the basic modeltheory for a theory of temporal reasoning about generic change.

Appendix: Modeltheoretic concepts of situation semantics (*cf.* ter Meulen 1986)

Situations s, s_0, s_1, … are triples consisting of a location l, an n-ary relation R, and a sequence of individuals x_1, … x_n, and a positive (+) or negative (–) polarity *pol*:

$$\langle l, \langle R_n, x_1, \ldots x_n, \rangle \, pol \rangle$$

Situation types S_1, S_2 are situations containing indeterminates (*cf.* variables) that serve to classify different situations as being of the same type.

Def. 1. s_0 *is of type* S_0 iff. for some function (anchor) f, $S_0[f]$ is part of s_0

"part of"—inclusion ordering between constituent sequences.

Def. 2. s_0 *is a part of* s ($s_0 < s$) iff all constituent sequences of s_0 are constituent sequences of s preserving polarity.

Def. 3. *Structure of situations* $\boldsymbol{S}$ consists of a non-empty collection $\boldsymbol{S}$ (factual situations) and a non-empty subcollection $\boldsymbol{S_0}$ (actual situations), such that:

1) every $s \in \boldsymbol{S_0}$ is coherent
2) if $s \in \boldsymbol{S_0}$ and $s_0 < s$ then $s_0 \in \boldsymbol{S}$
3) $\forall$ X, $\boldsymbol{S} \supseteq$ X $\Rightarrow \exists s \in \boldsymbol{S_0} \; \forall s_n \in$ X: $s_n < s$
4) $\boldsymbol{S}$ respects all constraints $\boldsymbol{\mathcal{C}}$ in $\boldsymbol{S}$.

Given the constraint $\boldsymbol{\mathcal{C}}$: $S_0 \Rightarrow S_1$ in $\boldsymbol{S}$:

Def. 4. Let s_0 be of type S_0, s_1 be of type S_1, then s_1 is a *meaningful option* for s_0 iff. $\forall f$ for all indeterminates in S_0, if $S_0[f]$ is part of s_0, then $\exists f' \, f \leq f' \, S_1[f']$ is part of s_1

Def. 5. s_0 *precludes* s_1 iff. either s_0 and s_1 are incompatible or if for ***no*** f s.t. $S_0[f]$ part of s_0, $\exists f' \, f \leq f' \, S_1[f']$ is part of s_1

$\boldsymbol{\mathcal{P}}_{\boldsymbol{\mathcal{C}}} = \{s_i \mid s_0$ *does not preclude* s_i *given* $\boldsymbol{\mathcal{C}}\}$,

$\boldsymbol{\mathcal{M}}_{\boldsymbol{\mathcal{C}}} = \{s_i \mid s_1$ is a *meaningful option* for s_0 *given* $\boldsymbol{\mathcal{C}}\}$,

Claim: $[\![s_0]\!]_{\mathcal{C}} = \boldsymbol{\mathcal{P}}_{\mathcal{C}} \cup \boldsymbol{\mathcal{M}}_{\mathcal{C}}$ is *persistent* in $\boldsymbol{S}$

$\forall s_1 \, s_2$ in $\boldsymbol{S}$ if $s_1 \leq s_2$ and s_1 in $[\![s_0]\!]_{\mathcal{C}}$ then s_2 in $[\![s_0]\!]_{\mathcal{C}}$

Def. 6 s is *recalcitrant* in $\boldsymbol{S}$ w.r.t. $\boldsymbol{\mathcal{C}} = \langle l_u, \langle involve, K(\langle x, S_1 \rangle), K(\langle y, S_2 \rangle)\rangle, + \rangle$ when for some f, $S_1[f]$ is part of s, no f' s.t. $f \leq f' \, S_2[f']$ is part of s.

Recalcitrant situations are counterexamples to $\boldsymbol{\mathcal{C}}$, but $\boldsymbol{\mathcal{C}}$ itself persists in $\boldsymbol{S}$.

A structure of situations $\boldsymbol{S}$ contain chains of constraints, partially ordered by $\boldsymbol{\mathcal{C}}_{\mathbf{n}} \leq \boldsymbol{\mathcal{C}}_{\mathbf{n+1}}$:

$\boldsymbol{\mathcal{C}}_{\mathbf{n}} = \langle l_u, \langle involve, K(\langle x, S_1 \rangle), K(\langle y, S_2 \rangle)\rangle, + \rangle$

$\boldsymbol{\mathcal{C}}_{\mathbf{n+1}} = \langle l_u, \langle involve, K(\langle x, S_3 \rangle), K(\langle y, S_4 \rangle)\rangle, + \rangle$

$\forall \, s$ if $[\![s]\!]_{\mathcal{C}_n}$ then $[\![s]\!]_{\mathcal{C}_{n+1}}$

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RÉSUMÉ

Pourquoi nous accrochons-nous aux croyances génériques qui nous servent à expliquer et comprendre le monde, même lorsqu'elles vont à l'encontre de faits ou d'observations évidentes avec lesquelles elles sont contradictoires ? Il est souvent rationnel de *ne pas* corriger ses croyances, même si les contre-exemples abondent, en reléguant ces derniers au statut d'exceptions anodines qui n'infirmeront pas les faits. L'étude de la structure focus/arrière-plan qui résulte de l'interaction entre les adverbes aspectuels, le temps et les pluriels nus nécessite une interface de tous les modules de la grammaire – la Structure Informationnelle – dans laquelle le contenu des énoncés avec pluriels nus peut être déterminé en contexte, et dans laquelle sont expliquées les différences épistémologiques entre exceptions et contre-exemples. Les informations génériques persistent dans les situations récalcitrantes parce que leur force explicative est « immunisée » contre les preuves contraires. Cette « immunisation » de l'information est un nouveau concept sémantique théorique dont nous précisons le contenu dans une sémantique des génériques qui emprunte à l'épistémologie.

MOTS-CLÉS

Contre-exemple, exception, force explicative, focus, structure informationnelle, adverbes aspectuels.